A Comprehensive Survey on Community Detection With Deep Learning

Abstract

Detecting a community in a network is a matter of discerning the distinct features and connections of a group of members that are different from those in other communities. The ability to do this is of great significance in network analysis. However, beyond the classic spectral clustering and statistical inference methods, there have been significant developments with deep learning techniques for community detection in recent years—particularly when it comes to handling high-dimensional network data. Hence, a comprehensive review of the latest progress in community detection through deep learning is timely. To frame the survey, we have devised a new taxonomy covering different state-of-the-art methods, including deep learning models based on deep neural networks (DNNs), deep nonnegative matrix factorization, and deep sparse filtering. The main category, i.e., DNNs, is further divided into convolutional networks, graph attention networks, generative adversarial networks, and autoencoders. The popular benchmark datasets, evaluation metrics, and open-source implementations to address experimentation settings are also summarized. This is followed by a discussion on the practical applications of community detection in various domains. The survey concludes with suggestions of challenging topics that would make for fruitful future research directions in this fast-growing deep learning field.